Forest Insect & Disease Management

Evaluation Report

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OAK WILT AND DUTCH ELM DISEASE IMPACT ON THE ZUMBRO WATERSHED, MINNESOTA USING 35MM AERIAL PHOTOGRAPHY

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INTRODUCTION

The Zumbro Watershed, located in southeastern Minnesota, encompasses approximately 14,350 acres of forest land, containing a large volume of elm and oak. A previous survey determined that Dutch elm disease and oak wilt were present throughout the watershed. These two diseases have the greatest potential for reducing timber supplies, destroying aesthetic values, reducing specific wildlife habitat, decreasing watershed protection and increasing flooding when the dead trees clog the waterways. The Resource Planning Group and the Forest Insect and Disease Management Group of the St. Paul Field Office cooperatively evaluated the disease impact.

OBJECTIVE

The objective of the survey was to determine the current and future impact of Dutch elm disease and oak wilt on the Zumbro Watershed.

METHODS

Areas with high mortality were sketch-mapped on a base map. The plotted areas were flown during July 1975 at 2,000 feet using an externally mounted 35mm camera (3,4). Two photographs were taken over each mortality area using color infrared film (Figures 1 and 2). The 35mm slides were projected on a screen for viewing and interpretation. The forested acreage was determined using a polar planimeter. The number of dead or dying elm and oak were recorded for each image. Twenty areas were selected for ground truth correlation. The number of logs and cause of condition were recorded for each correlation area. Observations were also made for infection centers that were missed during the photo interpretation. The photo data were adjusted using linear regression. The annual mortality and volume estimates were obtained from the field data.

RESULTS AND DISCUSSION

The mapping revealed that the watershed has four major areas in which the potential for greater damage is high (Figure 3). Of the 14,350 acres of forested land in the watershed, 7,800 acres were grouped into the four mortality areas. One thousand six hundred and seventy-five acres were classified as high mortality acres within the 7,800 acres (Table 1).

The acres surveyed, past mortality, and current mortality are summarized for each area in Table 2. Approximately three trees/acre were found to be dead or dying at the time of the survey. The trees/acre estimate is somewhat misleading in that dead trees were grouped and were not evenly distributed over the area.

RESULTS AND DISCUSSION (Continued)

The standing volume loss in the dead or dying elm and oak is estimated to be about 570M bd ft. The annual volume loss to Dutch elm disease and oak wilt within the four mortality areas is estimated to be about 49M bd ft (Table 3).

Elsewhere on the Zumbro Watershed the elm mortality is estimated to be between 10 and 20 percent. An 80 percent elm mortality is expected by 1990 (1). The mortality attributed to oak wilt is expected to increase throughout the watershed by 1990. The rate is unknown, but is expected to remain well below the elm mortality rate.

RECOMMENDATION

Due to the mixed ownership, presence of the smaller European elm bark beetle and the fact that Dutch elm disease has been established for several years, it is recommended that all merchantable elm in high value stands be harvested as soon as possible. This will maximize the resource return, start a new forest, and level off the rate of elm debris in the streams.

Sanitation measures such as immediate disposal of dead elm and oak material through burying or burning are recommended for high value areas such as parks and municipalities. This will not stop the disease spread, but will reduce the rate of spread.

The oak wilt control procedures outlined in Extension Folder 310, University of Minnesota, should be considered when the cost-benefit ratio is positive (2).

Literature Cited

(1) Anderson, R.L., and W.G. Stump. 1975. Dutch elm disease in the Lake States and Iowa (Slide script). Forest Insect and Disease Management, Northeastern Area S&PF, St. Paul, Minnesota 55108.

(2) French, D.W., and W.C. Stienstra. 1975. Oak wilt disease. Extension Folder 310, University of Minn.

(3) Klein, W.H. 1974. Evaluating a mountain pine beetle infestation with the aid of 35mm aerial photography. Branch of Forest Insect and Disease Prevention and Control, Ogden, Utah, Report #2.

(4) Meyer, M.P. 1973. Operating Manual - Montana 35mm Aerial Photography System. IARSL Research Report 73-3.

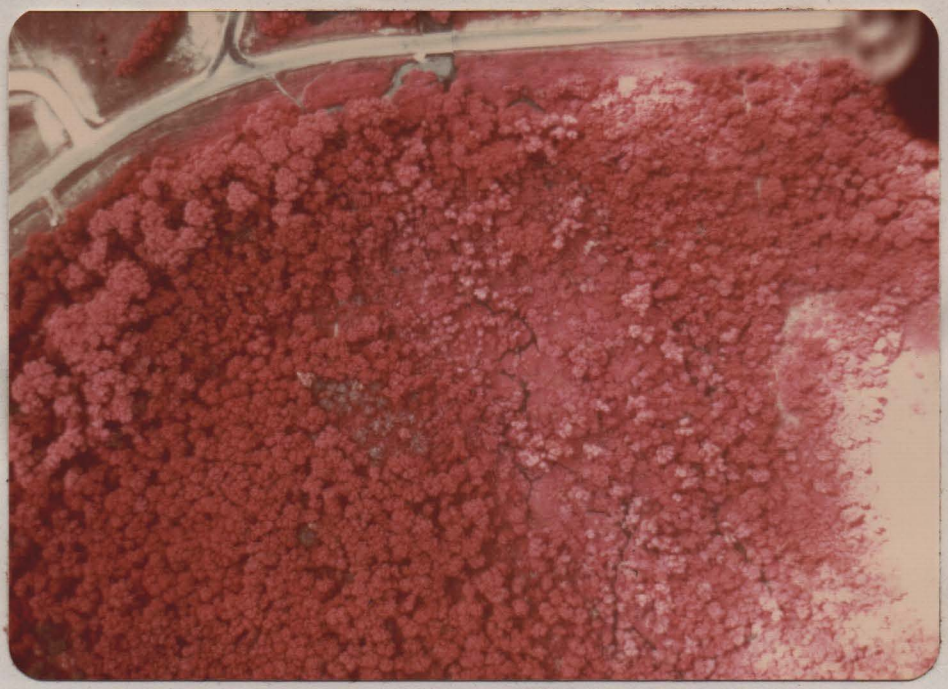

Figure 1. Oak wilt pocket from 2,000 feet using a 50mm lens on a 35mm camera (color infrared film).

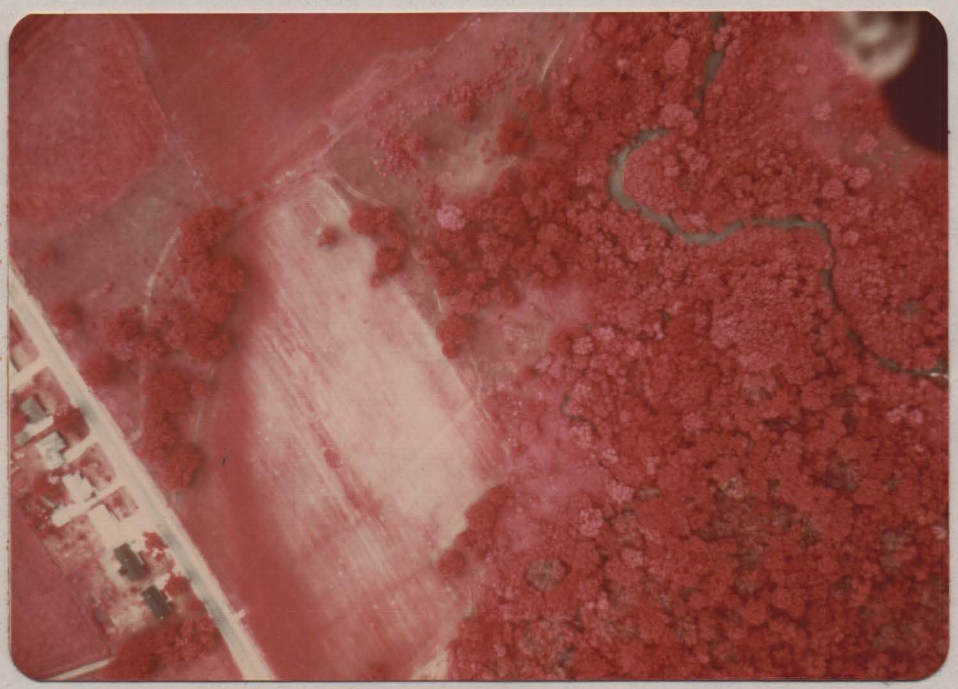

Figure 2. Dutch elm disease mortality areas from 2,000 feet using a 50mm lens on a 35mm camera (color infrared film).

Table 1.--Affected Forest Acreage.

Area No.	Sub-watershed	Forest Land	Affected Area
		Acres	
1	Cascade & Zumbro	3,210	620
2	Willow Creek	800	208
3	Bear Creek	2,938	712
4	Silver Creek & Hadley	757	136
		7,705	1,676

Table 2.--Mortality data for each of the affected areas.

Area No.	Photo Acres	Photo* Dead & Dying Elm Trees	Ground Truth Elm Dead	Ground Truth Elm Dying	Photo* Dead & Dying Oak Trees	Ground Truth Oak Dead	Ground Truth Oak Dying
1	125	509	1290	175	358	845	185
2	98	136	260	35	64	110	25
3	380	674	1110	150	419	645	140
4	85	103	146	18	22	30	5

* Adjusted through linear regression (correlation .659)

Table 3.--Elm and oak volume impact by area (Bd ft).

Area No.	Current Mortality (1 year)		Past Mortality (up to 7 years)	
	Elm	Oak	Elm	Oak
1	25025 ± 4200	14060 ± 1850	184470 ± 30960	64220 ± 8450
2	5005 ± 840	1900 ± 250	37180 ± 6240	8360 ± 1110
3	21450 ± 3600	10640 ± 1400	158739 ± 26640	49020 ± 6450
4	2574 ± 432	380 ± 50	20878 ± 3504	2280 ± 300

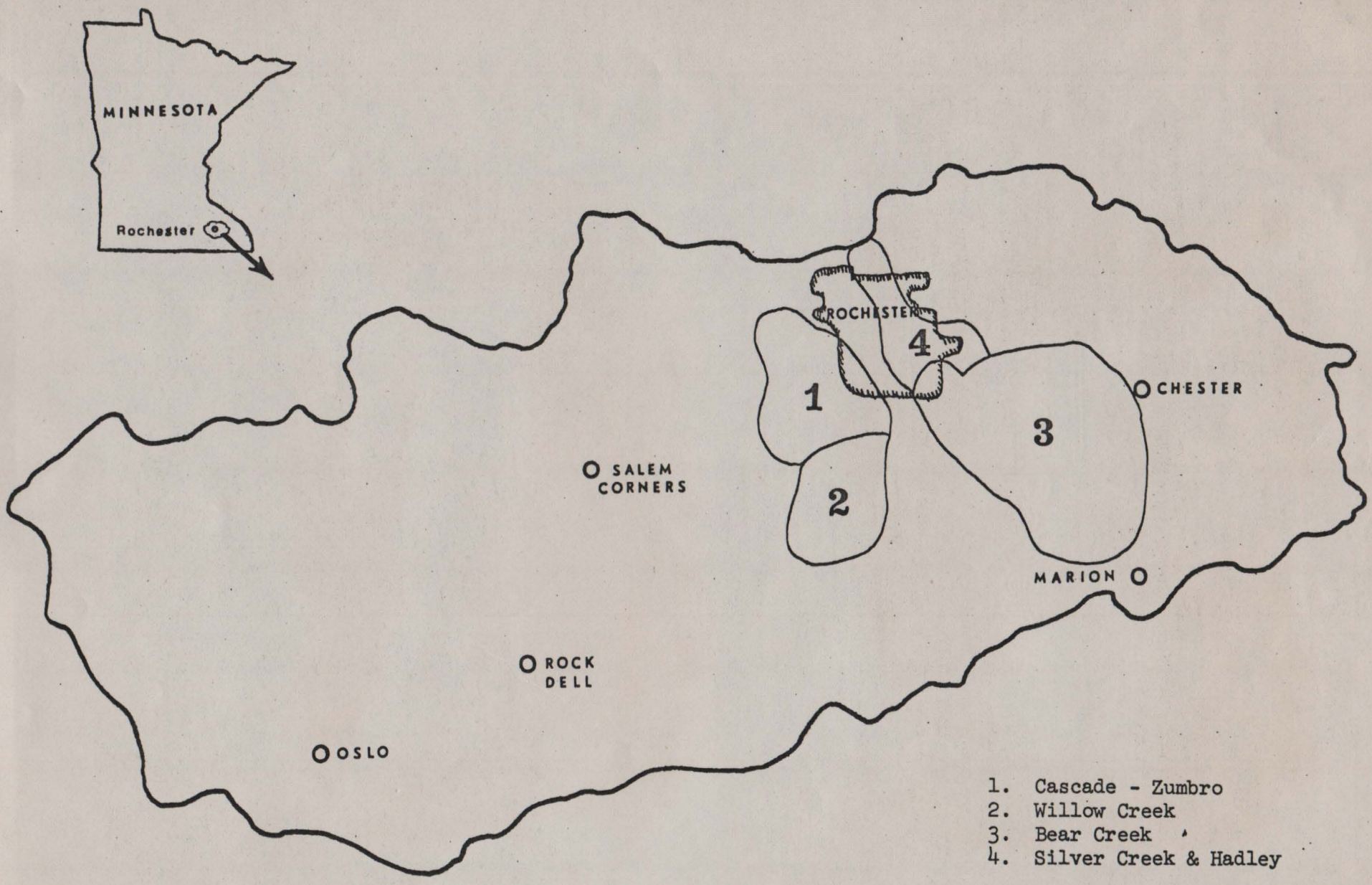

Figure 3 -- Map of Zumbro watershed with mortality areas marked.